

WHAT IS CLAIMED IS:

1. A force limiting workpiece holding device for use in holding a workpiece in a workpiece processing assembly having a spindle and a closer that applies a force, the workpiece holding device comprising:

a workpiece holder slidably mounted to the spindle, the workpiece holder including a plurality of circumferentially-spaced gripping segments that are movable between expanded and contracted positions to grip and release a workpiece; and

a force limiting coupling structure including a biasing structure having a spring force, the coupling structure operatively mountable between the workpiece holder and the closer such that a force applied by the closer to move the gripping segments of the workpiece holder between the expanded and contracted positions is transferred to the workpiece holder through the coupling structure and the biasing structure thereof, whereby a resultant force being applied to the workpiece holder by the closer is limited to the spring force of the biasing structure.

2. A force limiting workpiece holding device according to claim 1, wherein the workpiece holder is a step chuck collet.

3. A force limiting workpiece holding device according to claim 1, wherein the workpiece holder includes a draw-in to close configuration.

4. A force limiting workpiece holding device according to claim 1, wherein the workpiece holder is structured to grip an outer diameter of the workpiece.

5. A force limiting workpiece holding device according to claim 1, wherein the workpiece holder includes outwardly facing cam surfaces that slidably engage inwardly facing cam surfaces provided on a tapered cap mounted to the spindle, the cam surfaces being suitably tapered such that when the workpiece holder is moved by the closer into engagement with the tapered cap the cam surfaces of the workpiece holder interact with the cam surfaces on the tapered cap which causes the gripping segments of the workpiece holder to contract, thus causing the workpiece holder to grip the workpiece.

6. A force limiting workpiece holding device according to claim 1, wherein the closer includes a draw bar that interconnects the closer and the coupling structure, whereby actuation of the closer applies a force to the workpiece holder through the draw bar and coupling structure.

7. A force limiting workpiece holding device according to claim 1, wherein the closer is a hydraulic closer.

8. A force limiting workpiece holding device according to claim 1, wherein the biasing structure is a compression spring.

9. A force limiting workpiece holding device according to claim 1, wherein the coupling structure further comprises:

an elongated stem having one end mounted to the workpiece holder and an opposite end coupled to a spacer providing a first support surface; and

a coupler slidably mounted to the elongated stem between the spacer and workpiece holder, the coupler providing a second support surface and being operatively connected to the closer such that a force applied by the closer moves the coupler with respect to the stem,

wherein the biasing structure is positioned between the spacer and the coupler such that one end of the biasing structure rests on the first support surface and the opposite end of the biasing structure rests on the second support surface, whereby a force applied by the closer to move the gripping segments of the step chuck collet between the expanded and contracted positions is transferred from the draw bar associated with the closer to the coupler operatively connected thereto, from the coupler through the biasing structure and to the spacer, and from the spacer to the stem and workpiece holder mounted thereto.

10. A force limiting workpiece holding device according to claim 9, wherein the coupler has a stroke length with respect to the stem that is sufficiently larger than a stroke length of the closer.

11. A force limiting workpiece holding device according to claim 9, wherein the coupling structure includes a fastener threadably engaged with the opposite end of the stem to support the spacer, the fastener being adjustable with respect to the stem to adjust the position of the spacer thereby pretensioning the biasing structure.

12. A force limiting workpiece holding device according to claim 9, wherein the coupler includes outwardly extending projections that slidably engage within openings provided in the one end of the stem mounted to the workpiece holder,

13. A force limiting workpiece holding device according to claim 12, wherein outwardly extending projections are pins rigidly connected to the coupler.

14. A workpiece processing assembly comprising:
a spindle;
a closer mounted to one end of the spindle and structured to apply a force; and
a force limiting workpiece holding device mounted to an opposite end of the spindle, the force limiting workpiece holding device comprising:
a workpiece holder slidably mounted to the spindle, the workpiece holder including a plurality of circumferentially-spaced gripping segments that are movable between expanded and contracted positions to grip and release a workpiece; and
a force limiting coupling structure including a biasing structure having a spring force, the coupling structure operatively mountable between the workpiece holder and the closer such that a force applied by the closer to move the gripping segments of the workpiece holder between the expanded and contracted positions is transferred to the workpiece holder through the coupling structure and the biasing structure thereof, whereby a resultant force being applied to the workpiece holder by the closer is limited to the spring force of the biasing structure.

15. A workpiece processing assembly according to claim 14, wherein the workpiece holder is a step chuck collet.

16. A workpiece processing assembly according to claim 14, wherein the workpiece holder includes a draw-in to close configuration.

17. A workpiece processing assembly according to claim 14, wherein the workpiece holder is structured to grip an outer diameter of the workpiece.

18. A workpiece processing assembly according to claim 14, wherein the workpiece holder includes outwardly facing cam surfaces that slidably engage inwardly facing cam surfaces provided on a tapered cap mounted to the spindle, the cam surfaces being suitably tapered such that when the workpiece holder is moved by the closer into engagement with the tapered cap the cam surfaces of the workpiece holder interact with the cam surfaces on the tapered cap which causes the gripping segments of the workpiece holder to contract, thus causing the workpiece holder to grip the workpiece.

19. A workpiece processing assembly according to claim 14, wherein the closer includes a draw bar that interconnects the closer and the coupling structure, whereby actuation of the closer applies a force to the workpiece holder through the draw bar and coupling structure.

20. A workpiece processing assembly according to claim 14, wherein the closer is a hydraulic closer.

21. A workpiece processing assembly according to claim 14, wherein the biasing structure is a compression spring.

22. A workpiece processing assembly according to claim 14, wherein the coupling structure further comprises:

an elongated stem having one end mounted to the workpiece holder and an opposite end coupled to a spacer providing a first support surface; and

a coupler slidably mounted to the elongated stem between the spacer and workpiece holder, the coupler providing a second support surface and being operatively connected to the closer such that a force applied by the closer moves the coupler with respect to the stem,

wherein the biasing structure is positioned between the spacer and the coupler such that one end of the biasing structure rests on the first support surface and the opposite end of the biasing structure rests on the second support surface, whereby a force applied by the closer to move the gripping segments of the step chuck collet between the expanded and

contracted positions is transferred from the draw bar associated with the closer to the coupler operatively connected thereto, from the coupler through the biasing structure and to the spacer, and from the spacer to the stem and workpiece holder mounted thereto.

23. A workpiece processing assembly according to claim 22, wherein the coupler has a stroke length with respect to the stem that is sufficiently larger than a stroke length of the closer.

24. A workpiece processing assembly according to claim 22, wherein the coupling structure includes a fastener threadably engaged with the opposite end of the stem to support the spacer, the fastener being adjustable with respect to the stem to adjust the position of the spacer thereby pretensioning the biasing structure.

25. A workpiece processing assembly according to claim 22, wherein the coupler includes outwardly extending projections that slidably engage within openings provided in the one end of the stem mounted to the workpiece holder,

26. A workpiece processing assembly according to claim 25, wherein outwardly extending projections are pins rigidly connected to the coupler.

27. A method for holding a workpiece in a workpiece processing assembly having a spindle and a closer that applies a force, the method comprising:

slidably mounting a workpiece holder to the spindle, the workpiece holder including a plurality of circumferentially-spaced gripping segments that are movable between expanded and contracted positions to grip and release a workpiece; and

applying a force with the closer through a biasing structure to the workpiece holder so as to move the gripping segments of the workpiece holder between the expanded and contracted positions, whereby a resultant force being applied to the workpiece holder by the closer is limited to a spring force of the biasing structure.